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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 12/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/894,375

Applicant(s)

NANIS, LEONARD

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 10, 13, 14 and 32-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10, 13, 14 and 32-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4-7, 10, 13, 14 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nanis (U.S. Pat. 5,405,646) in view of Suenaga et al. (U.S. Pat. 5,478,657).

Nanis teach in accordance with the present invention, FIG. 3, ***the aluminum alloy substrate (disk)*** is first degreased by organic solvents, as in the prior art. The substrate is then moved into a vacuum sputtering system designated by the dotted block. Vacuum sputter deposition systems are well known. Suffice to say that in such systems the substrate is placed in an evacuated enclosure for processing. The first step is to further clean the surface by reverse sputter etching. In accordance with an embodiment of the invention, ***a first layer 16, FIG. 4, of material selected to bind with the aluminum surface is vacuum sputter deposited onto the surface. This is followed by vacuum sputter depositing a second layer 17 which serves as the nucleating layer for the subsequent electroless plating of a Ni-P layer.*** (Column 4 lines 47-61)

Pure chromium and pure titanium are preferred for the binder layer materials. Zirconium, vanadium, niobium, molybdenum, tantalum, tungsten and

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rhenum as well as alloy combinations of these elements may also be vacuum sputter deposited onto the aluminum disk as a first layer. The first (binder) layer covers the aluminum alloy and imbedded inclusions equally. This prevents the different behavior of these regions as occurs in the prior art process which relies on wet chemical processing only. (Column 4 lines 62-68; Column 5 lines 1-3)

The second vacuum sputter deposited thin layer is selected to: 1. bond tightly to the first layer; 2. further cover over inclusions; 3. resist oxidation during storage; 4. be insoluble in the electroless nickel solution; 5. nucleate the growth of electroless nickel; 6. bond tightly with electroless nickel; and 7. be nonmagnetic or selected that it does not interfere with the magnetic field produced by the read-write head. (Column 5 lines 4-11)

The most important requirements are the ability to nucleate Ni--P plating upon immersion in the electroless nickel bath and to provide non-magnetic behavior. Pure nickel is an effective nucleating layer and, if the aluminum alloy surface is smooth, the growth of Ni--P will continue as a smooth surface. Pure cobalt, pure iron and mixtures of Co, Fe and Ni will also be effective nucleating materials. (Column 5 lines 12-17)

Although field calculations show *that magnetic nickel may be used as the second layer, other non-magnetic materials may be deposited to nucleate Ni--P and satisfy all other requirements. Alloys of nickel mixed with amounts of alloy element sufficient to depress the Curie temperature to room temperature or below are suitable.* (Column 5 lines 24-30)

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Pure copper is non-magnetic and nucleates Ni--P growth from electroless nickel baths containing chloride ion and it also nucleates nickel-boron alloy from electroless nickel baths containing amino borane. ***Copper is thus an alternate second layer material. Pure palladium and pure platinum are also non-magnetic and can nucleate Ni--P deposition, and are suitable second layer materials. Alloy mixtures of nickel and copper are resistant to oxidation, as are also pure palladium and platinum, permitting storage without degradation of the surface after sputter deposition but before immersion in the electroless nickel tank. Alloys of copper with palladium and of copper with platinum are also suitable for the second layer. The Cu--Pd and Cu--Pt alloys may range within wide composition limits. Ternary mixtures of Cu, Pt and Pd in all proportions are also suitable second layer materials. In addition to palladium and platinum, second layer materials are pure gold, pure rhodium, pure osmium, pure ruthenium and pure rhenium. Alloys of said non-magnetic and Ni--P nucleating pure elements are also useful in binary combinations or multi-element mixtures over a substantially broad range of compositions.*** (Column 5 lines 39-61)

The remaining steps of the process are shown in FIG. 3 and are identical to the steps followed in the prior art FIG. 2. ***Wet chemical addition of Ni--P*** deposit is followed by polishing and the vacuum sputter deposition at chromium, magnetic cobalt alloy and carbon. (Column 6 lines 48-52)

As discussed and described above, ***the first and second layers cover the chemical non-uniformities and block their tendency to produce localized growth***

in advance of the main Ni--P deposit. In this way, the chemistry of the aluminum alloy has no effect on subsequent Ni--P deposition. Since the process covers over the chemical and metallurgical differences in the aluminum alloy, it may be possible to use less expensive alloy grades for which special treatments to remove intermetallic forming elements are not necessary. ***Also, glass, ceramic and polymeric substrates can be coated with Ni--P by this method.*** For example, the first layer may be chromium and titanium of which each bonds well to both glass, ceramic and plastic polymer materials. ***Other materials, such as lightweight titanium or magnesium alloys, can also be used as the substrate (disk).*** (Column 6 lines 53-68)

Figure 3 shows deposition of a chromium layer and deposition of a magnetic layer. (See Figure 3)

Figure 1 shows the substrate being treated on one side. (See Figure 1)

The difference between Nanis and the present claims is that the level of smoothness of the substrate is not discussed.

Suenaga et al. teach ***an unplated titanium disc*** which is to be plated with a layer and useful ***for making a magnetic disk having a surface roughness, Ra,*** defined as a mean height of the peaks from an imaginary center line on the surface, of said titanium disc just before plating ***of between 0.0002 micrometers and 0.0060 micrometers.*** (Column 9 lines 30-38)

Both pure titanium and titanium alloys can be used as the substrate. (Column 3 lines 50-53)

The titanium plate or titanium alloy is ***cold-rolled.*** (Column 4 lines 17-20)

The titanium plate can be plated with Ni-P. (Column 6 lines 49)

The motivation providing a substrate with a smooth surface roughness is that it allows it to be plated with a highly adhesive layer. (Column 2 lines 47-51)

As to the metal disk roughness, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by Suenaga et al. because overlapping ranges have been held to be a prima facie case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Nanis by utilizing a metal substrate of titanium or titanium alloy having a particular surface roughness as taught by Ishitobi et al. because it allows for achieving a highly adhesive plated layer.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nanis in view of Suenaga et al. as applied to claims 1, 4-7, 10, 13, 14 and 32-34 above, and further in view of Ross et al. (U.S. Pat. 5,980,997).

The difference not yet discussed is that the nucleating layer being a sacrificial reactive metallic layer is not discussed.

Ross et al. teach a method in accordance with my invention comprises the step of depositing a smooth metallic layer on a glass substrate and texturing the metallic layer with a laser beam. The metallic layer is preferably impact resistant, hard and has a high melting temperature (e.g., greater than 1000.degree. C.). (Column 2 lines 11-16)

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In a first embodiment, ***a metallic initiation layer is deposited on the glass substrate followed by electroless plating of NiP onto the initiation layer. The initiation layer is a material which facilitates electroless plating of NiP, such as Zn, Pd, Co, Fe, Rh, Be, NiP, Ni or alloys thereof.*** The initiation layer is formed because it is not possible to electroless plate NiP directly onto glass. After electroless plating, the NiP layer is then polished and laser textured. (Column 2 lines 17-24)

During one process in accordance with the first embodiment, ***the initiation layer is a thin Zn layer, and is formed by a zincate process. During this process, Al is deposited on the glass substrate, e.g. by sputtering, evaporation or other method. Thereafter, the substrate is subjected to the zincate process to form the Zn layer on the Al layer (the Al layer is typically either partly or completely consumed during the zincate process). A NiP layer is then plated onto the thin Zn layer, e.g. by electroless plating.*** The NiP layer is then polished and laser textured. Of importance, the thin Zn layer facilitates electroless plating of NiP, and the Al layer facilitates the formation of the Zn layer by the zincate process. (The zincate process does not work on bare glass.) In lieu of Al, other materials which can be subjected to a zincate process, e.g. Mg, can be used. (Column 2 lines 25-39)

In one variation of the first embodiment, ***an adhesion layer is deposited, e.g. by sputtering, on the glass substrate prior to depositing the Al layer.*** The adhesion layer causes the Al layer to strongly adhere to the substrate. ***The adhesion layer is typically Cr, Ta, Mo, W, V, Nb or alloys thereof.*** (Column 2 lines 40-44)

In a second embodiment, ***instead of using a Zn layer formed by the zincate process as the initiation layer, the initiation layer is formed on the substrate (or adhesion layer) by another process, e.g. sputtering or evaporation. The NiP layer is then formed on the substrate by electroless plating.*** (Column 2 lines 45-49)

Referring to FIG. 1A, a disk 110 includes a glass substrate 112, ***a Cr adhesion layer 114 and an Al layer 116*** Substrate 112 is typically chemically strengthened borosilicate glass. Cr adhesion layer 114 is typically 5 to 50 nm thick (in one embodiment it is 20 nm thick) and is formed by sputtering at a rate of 4 nm/second at a power of 1 kw and a pressure of 6.5 mtorr in argon. In one embodiment, an Intevac 250 A sputtering system (manufactured by Intevac of Santa Clara, CA) is used to D.C. magnetron sputter layers 114 and 116. Al layer 116 is typically 50 to 500 nm thick (in one embodiment 200 nm thick) and is also formed by sputtering, at a rate of 6.3 nm/second at a power of 1 kw and a pressure of 10 mtorr in argon. Cr layer 114 is optional, and is provided to ensure that subsequently deposited layers strongly adhere to glass substrate 112. Al layer 116 facilitates a subsequent zincate process. (Column 4 lines 40-55)

Referring to FIG. 1B, disk 110 is subjected to a zincate process, e.g. as described in the above-incorporated Lowenheim reference, to form a Zn initiation layer 117. Zn initiation layer 117 is typically about 5 to 10 nm thick. During this process, Al layer 116 is partially or completely consumed, depending on its thickness. (Column 4 lines 56-61)

In one embodiment, the substrate is subjected to a first zincate process, the resulting Zn layer is stripped off by dilute nitric and sulfuric acids, the substrate is subjected to a second zincate process, the resulting Zn layer is stripped off, and then the substrate is subjected to a third zincate process. These process steps result in formation of an improved NiP film (formed in a subsequent plating process, described below) with a finer NiP nodule structure, and a smoother NiP surface, but it is not presently clear why this is. In other embodiments, the zincate process is only performed twice. In yet other embodiments, the zincate process is only performed once. (Column 4 lines 62-68; Column 5 lines 1-6)

Referring to FIG. 1C, ***NiP layer 118 is deposited to a thickness between 5 and 10 microns, and typically about 8 microns, by electroless plating.*** (Column 5 lines 7-10)

In lieu of Cr as adhesion layer 114, other materials can be used, e.g. Ta, Mo, W, V or Nb, or alloy thereof. Alternatively, adhesion layer 114 can be omitted. (Column 6 lines 46-48)

In lieu of borosilicate glass, other glass compositions or materials such as silicon, SiC, ceramic, glass ceramic, or sintered carbon can be used as substrate 112. (Column 6 lines 54-56)

FIG. 3 illustrates a magnetic disk 150 during a manufacturing process in accordance with a second embodiment of my invention, ***including glass substrate 112 and optional Cr adhesion layer 114 as discussed above. However, in the embodiment of FIG. 3, a Zn initiation layer 115 is formed by a vacuum deposition***

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process such as sputtering. When formed by sputtering, Zn layer 115 can be sputtered at a rate of 24 nm/second at a power of 1 kw and a pressure of 10 mtorr in argon. Zn layer 115 is typically 60 nm thick. (Column 6 lines 59-68)

Thereafter, NiP layer 118 is electroless plated onto Zn initiation layer 115.

(Column 7 lines 1-2)

In lieu of Zn, other material s capable of initiating electroless plating can be used, e.g. Pd, Co, Fe, Rh, Be, NiP, Ni and alloys thereof. Such materials can be vacuum-deposited (e.g., by sputtering) either onto adhesion layer 114, or directly onto substrate 112. (Column 7 lines 8-12)

The motivation for utilizing a nucleating layer which is a sacrificial reactive metallic layer is that it allows facilitating electroless plating. (Column 2 line 20)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a nucleating layer which is a sacrificial reactive metallic layer as taught by Ross et al. because it allows for facilitating electroless plating.

Claims 1, 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nanis (U.S. Pat. 5,405,646) in view of Ishitobi et al. (U.S. Pat. 6,152,976).

Nanis is discussed above and all is as applies above. (See Nanis discussed above)

The difference between Nanis and the present claims is that that the roughness of the aluminum alloy substrate is not discussed.

Ishitobi et al. teach providing a disc substrate for magnetic recording which is polished with aqueous abrasive composition. The composition is advantageously utilized for polishing substrates made of a disc blank of aluminum or an aluminum alloy such an aluminum magnesium alloy. (Column 5 lines 34-40)

The substrate polished with the abrasive composition of the present invention have extremely minimized surface irregularities. The surface roughness is about 3 to 5 Angstroms and thus the smoothness is excellent. (Column 5 lines 49-53)

The motivation for utilizing a substrate of aluminum with a roughness of 3 to 5 angstroms is that it allows for providing a substrate that is capable of high recording density. (Column 2 lines 58-59)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Nanis by utilizing a specific roughness for the aluminum alloy substrate as taught by Ishitobi et al. because it allows for providing a substrate which is capable of high recording.

Response to Arguments

Applicant's argument, see Paper No. 7, filed 9-12-03, with respect to the rejection(s) of claim(s) 1-14 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

Specifically, Applicant is correct to point out that Tada et al. teach polishing the surface of a metal plated Ni-P substrate which the pending claims do not require. Applicant is also correct in pointing out that Liu et al. do not teach a metal substrate with

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the required smoothness. Tada et al. and Liu et al. have been withdrawn. Agarwal has been withdrawn as well since it is a cumulative teaching.

Newly cited reference to Suenaga et al. has been cited to show a metal disk substrate of titanium being initially polished to produce a smooth roughness in the range of 0.0002 to 0.0060 micrometers (i.e. 2 to 60 Angstroms) which overlaps Applicant's claimed range of roughness and thus makes obvious Applicant's claimed invention when considered in combination with Nanis. Newly cited reference to Ishitobi et al. has been cited to show a metal disk substrate of aluminum being initially polished to produce a smooth roughness which is within Applicant's claimed range and thus makes obvious Applicant's claimed invention when considered in combination with Nanis. Ross has been cited to teach the zinc layer.

This action will be made NON-Final based on the new 35 U.S.C. 103 rejections made above.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 703-308-3807. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 703-308-3322. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
November 25, 2003